Next Generation Personal Protective Equipment (PPE) Discussion Meeting

June 26 – 27, 2013

After Action Report

9/24/2013

U.S. Department of Homeland Security
Science and Technology Directorate

Support to the Homeland Security Enterprise and First Responders Group

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Homeland Security
Science and Technology

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Executive Summary

The U.S. Department of Homeland Security (DHS) Science and Technology Directorate's (S&T) Support to the Homeland Security Enterprise and First Responders Group, commonly referred to as the First Responders Group (FRG), works to strengthen the emergency preparedness and response community's ability to protect the homeland. By involving first responders throughout the technology development process, FRG pursues a better understanding of needs and requirements and develops innovative solutions to the most pressing challenges faced during daily operations and emergencies.

FRG engages first responders at an operational level to identify their roles, needs, concerns, and obstacles. The need for responder input led to the creation of the First Responder Resource Group (FRRG). The FRRG is comprised of over 120 practitioners from around the country representing multiple disciplines including fire, law enforcement, emergency medical services (EMS), emergency management, communications, and the medical community. In addition to speaking to the needs of their respective disciplines, many of the members represent major national emergency response associations.

As a result of the Fall 2012 FRRG Meeting, a subgroup comprised of first responder personnel and policy-oriented officials recognized a broad, overarching gap facing the first responder community. They described the need for a cross-discipline "base ensemble" that would provide an increased level of protection over their existing garments from multiple threats that may be encountered by responders. It was envisioned that this would be used as a daily uniform by EMS personnel, law enforcement officers, or as station wear by firefighters. The need for specialized garments for each discipline was recognized (such as Level-A hazardous materials suits, body armor, structural firefighting gear, etc.). With the collaboration and

Findings (Representative Summary)

- The primary value in the Next Generation PPE Discussion Meeting was the collaboration among industry, the academic and material science communities, trade/professional organizations, standards professionals, and S&T and other federal agency staff on next generation PPE requirements and capabilities.
- Unlike the Department of Defense, the first responder community does not have a centralized procurement system, which deters some developers from investing in new technologies without the guarantee that one or more large contracts will be awarded.
- In addition to the FRRG, input from additional groups should be solicited for the creation of ORDs to ensure capability gaps are being correctly identified.
- Government agencies should strengthen coordination efforts to discuss projects they are funding instead of randomly discovering research and development efforts being conducted by other agencies.
- The costs and timelines associated with certifications and standards can inhibit many small manufacturers from entering or remaining in the first responder market.
- Many stakeholders in attendance expressed interest in collaborating with S&T further on the development of next generation PPE, including defining an approach and focus areas, determining a schedule for multi-year project execution, and defining the methods to execute the S&T PPE Strategic Plan.

support from the embedded FRG program manager who provided guidance and helped keep the discussions focused, the subgroup members drafted an Operational Requirements Document (ORD) for this "base ensemble" Personal Protective Equipment (PPE) garment. ORDs are used to clearly identify an existing need and anticipated mission space as well as the specific requirements that must be met for a solution to be considered successful.

To effectively and efficiently obtain information and facilitate stakeholder discussions regarding next generation PPE requirements and capabilities, FRG organized a Next Generation PPE Discussion Meeting. This meeting was held in Washington, D.C. from June 26 to 27, 2013, and included 165 in-person and webinar participants. Its purpose was to gather a multitude of opinions and expert advice on PPE, provide an overview of FRG and S&T goals and initiatives, and apply input and insights captured during the meeting to FRG's Next Generation PPE White Paper. This white paper discusses S&T's overall direction for next generation PPE and the S&T PPE Strategic Plan.

Overview

The Next Generation Personal Protective Equipment (PPE) Discussion Meeting provided the opportunity for open dialogue among first responders, industry, the academic and material science communities, trade/professional organizations, standards professionals, and S&T and other federal agency staff regarding the PPE concept for "next generation PPE," defined here as developing over the next 7 to 10 years. As part of this meeting, S&T delivered a series of presentations on its process for soliciting potential technology solutions and explaining the goals for the next generation of PPE. The first responder community discussed their capability gaps, including areas previously identified at the Fall 2012 First Responder Resource Group meeting. Industry and academic professionals discussed concerns with developing new technologies, while government agencies spoke about their current related projects in development. The information presented over the duration of the PPE Discussion Meeting, as well as a recording of the meeting in its entirety, is available for download at https://share.dhs.gov/nexgenppe-26-27-jun-2013/.

Background and Methodology

The objective of the PPE Discussion Meeting was to discuss goals for the development of next generation PPE and focus on an integrated ensemble for all first responder disciplines that provides multi-threat protection, increases the safety of first responders, and reduces the amount of equipment responders will be required to carry.

Prior to the PPE Discussion Meeting, registrants were provided with read-ahead materials, including FRG's Next Generation PPE White Paper and the ORD for the PPE base ensemble. These materials served as drafts for discussion and provided background material for the work S&T has done in regards to PPE.

This meeting served as the first of many planned meetings in which stakeholders from around the country can contribute to developing the strategy for next generation PPE. Future discussions will include responder capability gaps, technology solutions in development, and potential partnerships with S&T. During these meetings, each stakeholder can share their subject matter expertise and form partnerships with other stakeholders, which will lead to stronger development efforts. The results from these discussions will help shape the S&T PPE Strategic Plan, further defining the approach and focus areas, determining a schedule for multi-year project execution, and defining the methods to execute the plan.

This meeting was a valuable collaboration opportunity for FRG to understand the status of current research on next generation garments and technologies for first responders. S&T plans to assess the extent to which current research aligns with identified first responder requirements, inform stakeholders of the direction of proposed future S&T research, and engage relevant stakeholders to develop the appropriate mix of projects required to improve the performance of PPE.

Opening Remarks

FRG Director Dr. Robert Griffin opened the PPE Discussion Meeting by welcoming the attendees and introducing discussion objectives, S&T's organizational construct, the mission and guiding principles of

FRG, and an overview of FRG's stakeholder community. In addition, Dr. Griffin conducted a brief overview of the Tier 1 capability gaps noted in Project Responder 3 (http://www.firstresponder.gov/Miscellaneous%20PDFs/ProjectResponder3Report.pdf), the third iteration in a series of studies produced by S&T, the Federal Emergency Management Agency (FEMA), and the Homeland Security Studies and Analysis Institute (HSSAI) that identify gaps in current emergency response capabilities. Tier 1 capability gaps are those priorities assessed by first responders to be the most critical when responding to a catastrophic event.

Mr. Joseph Martin, Deputy Director of FRG, provided the breakdown for the FRG Technology Flow (Appendix A) and the process for technology development and adaption. He also described the broader strategy for a Responder Development Center that would serve as a focus area within S&T for first responder needs. Currently under consideration, the Responder Development Center would assist in the development and integration of a suite of PPE products that will address the capability gaps identified by the first responder community, increase the safety of the responder community, and reduce their logistical burden.

Mr. William Deso, a Program Manager in FRG's Responder Technologies (R-Tech) division, also welcomed the group and provided a brief overview of R-Tech and how its work fits into the overall mission of FRG. He noted that while R-Tech typically focuses on rapid (18 to 24 months) technology solutions, the goal for next generation PPE requires a holistic approach, including a 7- to 10-year development with incremental improvements over the course of that time (Appendix B). Mr. Deso also shared that this meeting's discussions will help inform the S&T PPE Strategic Plan. This plan is anticipated to include responder capability gaps and requirements, technical abilities of industry to meet those needs, and the current and planned research and development (R&D) efforts of other agencies. He noted that he and his FRG colleagues looked forward to hearing input from all the stakeholders.

Plenary Presentations and Information Sessions

During the PPE Discussion Meeting, attendees were encouraged to speak openly about capability gaps, protection requirements, the current state of PPE materials, obstructions to meeting responder requirements, and how S&T can assist in advancing the next generation of PPE. Briefings provided situational awareness on the S&T PPE Strategic Plan, which will help guide the implementation of next generation PPE development and provide information about how to conduct business with S&T through R&D partnerships.

Plenary Presentations

- *Next Generation Personal Protective Equipment:* William Deso, DHS S&T
- *Next Generation PPE Project for DHS S&T First Responders Group (FRG):* Brittany McCracken, FirstLink
- *Cooperative Research and Development Agreements (CRADAs):* Marlene Owens, DHS S&T
- *Opportunities for Engagement*: Stephen Hancock, DHS S&T

Key Findings

Recently Developed Technologies and New Technologies in Development:

- Osen-Hunter Innovative Technologies has developed a hybrid respiratory protection system to satisfy the unique requirements of the first responder and military special operations communities. The Self-Contained Hybrid Integrated Evolution Life-support Device (SHIELD) is marketed as the lightest, most compact, sustained respiratory protection system available and is currently being fielded by some government agencies.
- The Technical Support Working Group (TSWG) of the Combatting Terrorism Technical Support Office (CTTSO) is currently developing the XM54, a law-enforcement-specific mask that increases protection from flames and improves breathing capability.
- The United States Coast Guard Research and Development team is currently working on an all-in-one PPE ensemble. The product has been introduced to TSWG, but the challenge of buoyancy is still being faced.
- TSWG is developing a combination system with Avon Protection Systems to include a hose that works with a mask and a self-contained breathing apparatus (SCBA). This tool differs from existing SCBAs in that it activates and covers automatically when a first responder is not in Powered Air-Purifying Respirator (PAPR) mode.
- BAE Systems has developed a hands-free thermal imaging camera system for firefighters that includes a see-through display with 100 percent visibility. This device, as marketed, can be implemented into any existing facemask with Thermal On Demand (TOD) for see-through visual assistance when needed.
- As new technologies are being created, S&T is working with the National Fire Protection Association (NFPA) to determine a new set of standards that will facilitate these developments.

Concerns/Notes Surrounding Next Generation PPE:

- Industry representatives are confused about how they can assist DHS with implementation of a robust Next Generation PPE plan when the DHS strategic plan is still being developed and was not presented.
- Unlike DoD, the first responder community does not have a centralized procurement system, which deters some developers from investing in new technologies without the guarantee that one or more large contracts will be awarded. The amount of the planned DoD procurement award is also often known at the start of the development program, which provides industry with a better estimate of their potential return on investment (ROI). Next generation PPE is a great concept, but vendors need to have an understanding of the potential ROI. Private industry prioritizes their internally-funded development efforts based on the feasibility of commercialization and the potential size of the market.
- First responders are hesitant to deploy technologies that will support the "Christmas Tree Effect"—that is, adding gadgets to their current PPE in order to fulfill requirements.
- Tools should be as simple as possible to operate and maintain to ensure that they can be used by responders in operational scenarios.
- In addition to the FRRG, FRG should solicit input from additional groups to develop ORDs to ensure capability gaps are correctly identified.

- Because PPE is often a management priority, overall appearance should also be taken into consideration when creating garments or devices that will be worn, as well as the ability for a garment to be tailored to fit both male and female first responders. The way riot police teams on the street appear could escalate public disorder, so how the equipment looks from a tactical standpoint can be important for some disciplines.
- The PPE ensemble needs to take into account the physiological needs of the body (e.g., heating and cooling); PPE could be created as a tiered solution to address these needs.
- Regardless of function, air cylinders used in the construction of a breathing apparatus must meet standards set forth by the Department of Transportation. Manufacturers must meet those standards, which may be irrelevant to the use of their products, further deterring development efforts.
- One of the impediments with standards is often the cost associated with certification testing and the requirement for periodic recertification, even if the PPE specification has not changed since initial certification. The need for all the components in a PPE ensemble to be certified as a unit can also be an issue for some manufacturers. If one component of the ensemble is changed, the ensemble with the new component needs to be recertified. This potentially can be a financial burden for some manufacturers.
- Garments are available that have been NFPA-certified but must be recreated to fit those of the National Institute of Justice, which may not be compatible with the NFPA standards.
- To assist with R&D, funding assistance should be provided or partnerships should be developed so that small businesses can find sources of funding for their R&D efforts.
- Small businesses have good ideas and solutions, but may not know how to commercialize them. Certifications cost money and are required, which becomes a burden to small businesses.
- The first responder community is complex and heavily reliant on state and local funding for purchasing equipment and PPE. Any federal assistance or guidance in this area would be helpful.
- Government agencies should strengthen efforts to discuss projects they are funding instead of randomly discovering R&D efforts being conducted by other agencies.

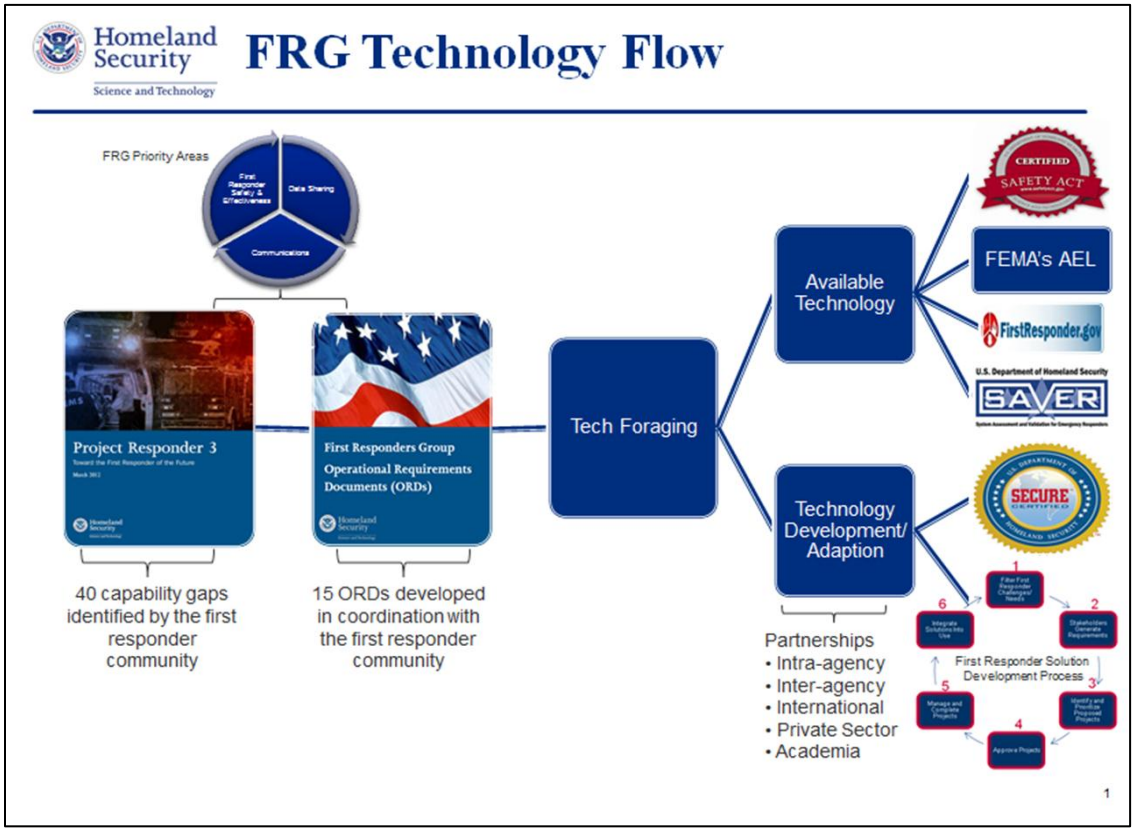
Potential Partnerships:

- FEMA Region I currently has a pilot program in Boston that fosters collaboration between first responder groups and higher education institutions and is interested in expanding this effort to other communities. These pilot programs develop strategies for best practices and serve as academic resources in areas of science, technology, engineering, and mathematics (STEM). To date, many innovative solutions have been developed as a result of responders being able to propose ideas to the academic community. For more information regarding this program, organizations and agencies should reach out to their FEMA Region Director (www.fema.gov/leadership).
- TSWG is developing the first positive/negative mask, XM55, which is still in the prototype phase. Currently, there is still a challenge related to communication issues; TSWG is seeking first responder assistance for a field evaluation in October 2013 (visit twww.cttso.gov for more information).
- TSWG has also created a lightweight undergarment that provides NFPA Class 3 protection and based on feedback from users that were received by TSWG personnel, is noted as having been a huge success.

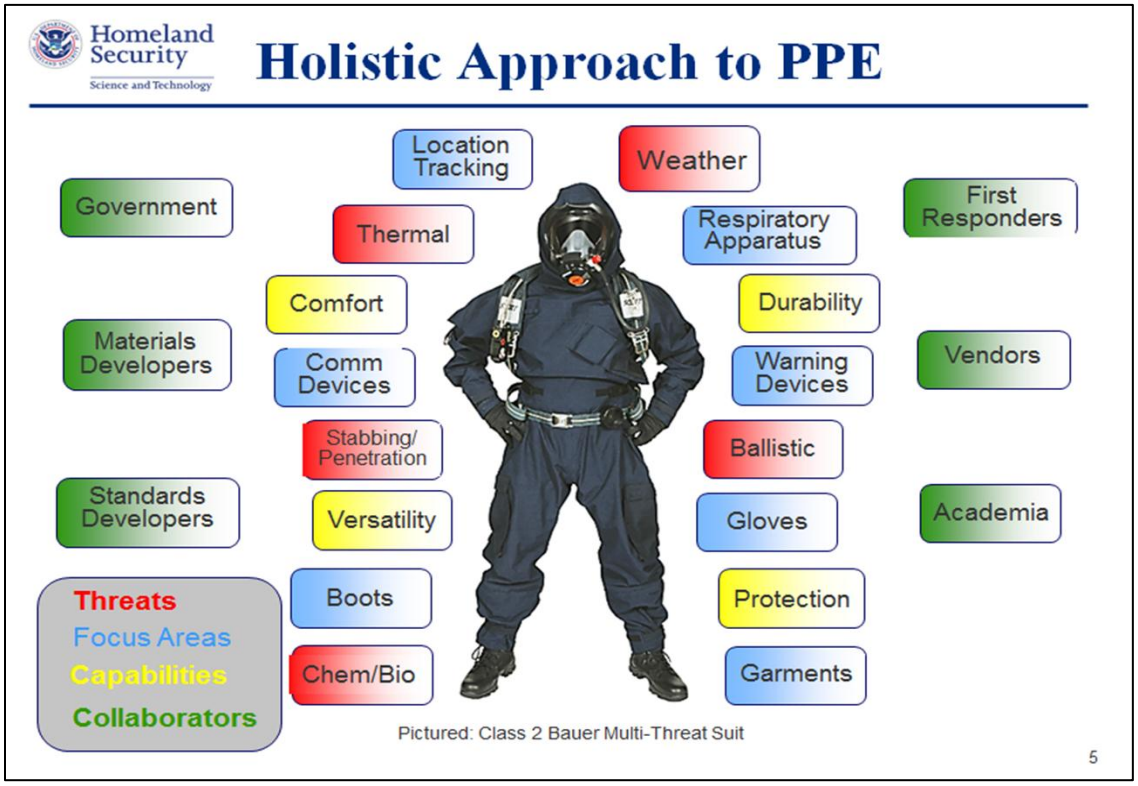
Conclusion

The Next Generation PPE Discussion Meeting was the first in a series of planned outreach efforts designed to encourage collaboration among stakeholders regarding next generation PPE. The general session served as an open forum that allowed stakeholders to share requirements and challenges, along with potential solutions and barriers to innovation. Additionally, many stakeholders in attendance shared their interest in collaborating with DHS S&T on the development of next generation PPE by helping to further define the approach and focus areas, determine a schedule for multi-year project execution, and define the methods to execute the Next-Generation PPE Strategic Plan.

Appendix A: First Responders Group Technology Flow



Appendix B: Holistic Approach to Personal Protective Equipment



Appendix C: Next Generation Personal Protective Equipment Discussion Meeting Stakeholder Feedback Results

Category / Focus Area	Percent of Respondents Who Rated "Perfect" (5 out of 5)	Average Respondent Rating
Overall Structure and Process: Benefit to you and your organization	28%	**3.8 out of 5**
Overall Structure and Process: Opportunity to meet, coordinate, and partner with First Responders, Federal, Industry, Academic, and/or Standards professionals	44%	**4.1 out of 5**
Overall Structure and Process: (For First Responders) Providing a forum to share requirements and challenges with DHS S&T	46%	**4.3 out of 5**
Overall Structure and Process: (For Industry, Academic, Research & Development) Providing a forum to share innovations and barriers to innovations with DHS S&T	16%	**3.5 out of 5**
Fred Chan, NATICK — Moderation Performance (helpfulness in leading the discussion, guidance, etc.):	33%	**3.5 out of 5**
Logistics: Invitational Travel	0%	**2.0 out of 5**
Logistics: Registration for web	33%	**3.6 out of 5**
Logistics: Experience with web during conference	0%	**3.0 out of 5**
Logistics: Registration for In Person Attendance	60%	**4.5 out of 5**
Logistics: Experience with HSAI Conference Center 90 K Street	48%	**4.2 out of 5**

Appendix D: Next Generation Personal Protective Equipment Discussion Meeting Full Session Agenda

Day One Wednesday, June 26, 2013		
Time	**Topic**	**Speaker**
8:30 – 9:00 AM	Welcome and Keynote Address	**Dr. Robert Griffin, DHS**
9:00 – 9:30AM	PPE FRG Strategy	**Joseph Martin, DHS**
9:30 – 10:00 AM	Meeting Objective	**William Deso, DHS**
10:00 – 10:15 AM	Greetings, administrative items, and ground rules	**Fred Chan, NATICK**
10:15 – 10:30 AM	PPE Roadmap	**Brittany McCracken, FirstLink**
10:30 – 10:45 AM	Break	
10:30 – 11: 45 AM	Engaging the First Responder Community (by Discipline)	**Fred Chan**
11:45 AM – 1:00 PM	Lunch*	
1:00 – 2:30 PM	Engaging the First Responder Community – Continued	**Fred Chan**
2:30 – 2:45 PM	Break	
2:45 – 4:45 PM	Engaging the First Responder Community – Continued	**Fred Chan**
4:45 – 5:00 PM	Day One Wrap-Up	**Fred Chan**

Day Two Thursday, June 27, 2013		
Time	**Topic**	**Speaker**
8:30 – 8:45 AM	Recap of Day One Discussion	**Fred Chan**
8:45 – 9:00 AM	Conducting Business with DHS	**Stephen Hancock, DHS**
9:00 – 9:45 AM	Research and Development Partners (by Expertise)	**Fred Chan**
9:45 – 10:00 AM	Break	
10:00 – 11:00 AM	Research and Development Partners – Continued	**Fred Chan**
11:00 – 12:15 PM	Lunch*	
12:15 – 1:45 PM	Manufacturing and Vendor Communities (by Specialty)	**Fred Chan**
1:45 – 2:00 PM	Break	
2:00 – 2:45 PM	Manufacturing and Vendor Communities – Continued	**Fred Chan**
2:45 – 3:45 PM	Cooperative Research and Development Agreement	**Marlene Owens, Technology Transfer Program Manager, DHS**
3:45 – 4:15 PM	Day Two Wrap-Up	**Fred Chan**
4:15 – 5:00 PM	Closing Remarks	**Joseph Martin**

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